AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.6.1.4

Genetic inheritance

Past-paper questions

Tier	**Higher**
Question groups	**5**
Available paper years	**2020–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.6.1.4 Genetic inheritance

Question 01

November 2020 | 8464/B/2H | Original Q5

0 5 This question is about inheritance.

Humans have 23 pairs of chromosomes in each body cell.

One pair of chromosomes determines sex.

0 5 . 1 Complete **Figure 5**.

[2 marks]

Figure 5

		Female	
		X	**X**
Male			

0 5 . 2 In some families all children are the same sex.

Give the reason why.

[1 mark]

4.6.1.4 Genetic inheritance

Question 01 · continued

Cystic fibrosis (CF) is an inherited disorder.

0 5 . 3 A man and a woman do **not** have CF.

The man and the woman have a child who has CF.

Draw a Punnett square diagram to find the probability that their next child will have CF.

Use the symbols:

T = dominant allele

t = recessive allele

Draw a ring around the genotype of any children with CF.

[4 marks]

Probability = _____

Question 5 continues on the next page

4.6.1.4 Genetic inheritance

Question 01 · continued

Embryo screening for CF can be done by two methods.

Method 1

- The woman becomes pregnant by sexual intercourse.
- After 10 weeks of pregnancy a fine needle is inserted into the uterus.
- A sample of the fluid surrounding the embryo is taken.
- The DNA of the embryo is tested for CF.

The screening is done free by specialist hospitals for couples who are at risk of having a child with CF.

There is a small risk of miscarriage.

Method 2

- The couple use In Vitro Fertilisation (IVF) to produce a small number of embryos.
- Each embryo is tested for CF.
- One or two embryos without CF are implanted in the woman's uterus.

In 2017 the success rate for having a baby by IVF for women under 35 years was 30%

IVF is a stressful, invasive procedure.

In most UK areas the free public health service does not provide IVF for all women asking for it.

4.6.1.4 Genetic inheritance

Question 01 · continued

0 5 . 4 Suggest **three** reasons for choosing **Method 1** instead of **Method 2**.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

0 5 . 5 Suggest **one** advantage of **Method 2**.

[1 mark]

_____

_____

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4.6.1.4 Genetic inheritance

Question 02

November 2021 | 8464/B/2H | Original Q6

0 6 This question is about genetic disorders.

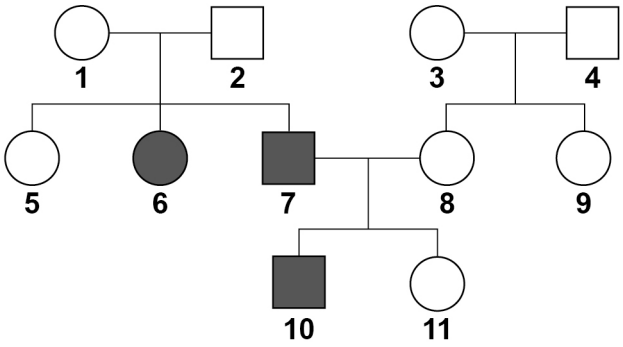
0 6 . 1 Some people are heterozygous for a genetic disorder.

Define the term 'heterozygous'.

[1 mark]

0 6 . 2 **Figure 6** shows the inheritance of a genetic disorder in a family.

Figure 6



Key

Female who does **not** have the disorder

Male who does **not** have the disorder

Female who has the disorder

Male who has the disorder

4.6.1.4 Genetic inheritance

Question 02 · continued

Person **7** and person **8** plan to have another child.

Determine the probability that the child will be a **male** who has the disorder.

You should:

- draw a Punnett square diagram
- identify the genotype of person **7** and the genotype of person **8**
- identify the phenotype of each offspring genotype
- use the symbols:

  H = dominant allele

  h = recessive allele

[6 marks]

Probability of having a male child with the disorder = _____

Question 6 continues on the next page

4.6.1.4 Genetic inheritance

Question 02 · continued

0 6 . 3 Polydactyly is a different inherited disorder.

Two parents do **not** have any alleles for polydactyly in their ordinary body cells.

These parents produced a child with polydactyly.

Explain how polydactyly suddenly occurred in this family.

[4 marks]

11

4.6.1.4 Genetic inheritance

Question 03

June 2023 | 8464/B/2H | Original Q1

0 1 Sexual reproduction in humans involves the production of egg cells and sperm cells.

0 1 . 1 Name the type of cell division that produces egg cells and sperm cells.

[1 mark]

_____

0 1 . 2 Sexual reproduction produces offspring that are genetically different from each other.

Give **two** reasons why sexual reproduction causes variation in the offspring.

[2 marks]

1 _____

_____

2 _____

_____

Question 1 continues on the next page

Question 03 · continued

Polydactyly is an inherited disorder.

The allele for polydactyly is dominant, **D**.

A person with two copies of the allele **d** will **not** have polydactyly.

0 1 . 3 A person with the genotype **DD** is homozygous.

What word describes the genotype **Dd**?

[1 mark]

_____

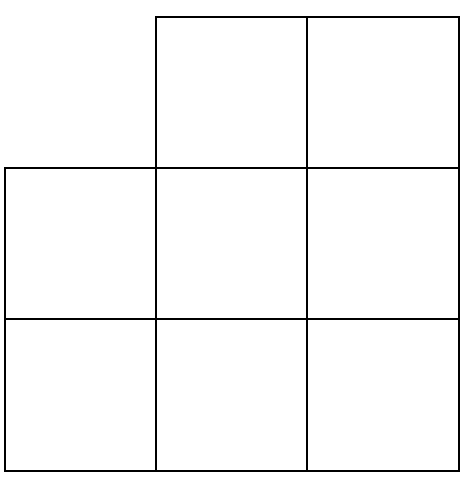
0 1 . 4 A person with the genotype **Dd** and a person with the genotype **dd** plan to have a child.

Determine the probability that the child will have polydactyly.

You should:

- complete the Punnett square diagram
- identify any offspring genotype that would have polydactyly.

[5 marks]



Probability that the child will have polydactyly = _____

4.6.1.4 Genetic inheritance

Question 03 · continued

0 1 . 5 Embryos can be screened for the alleles that cause inherited disorders.

Give **two** advantages of embryo screening.

[2 marks]

1 _____

_____

2 _____

_____

11

Turn over for the next question

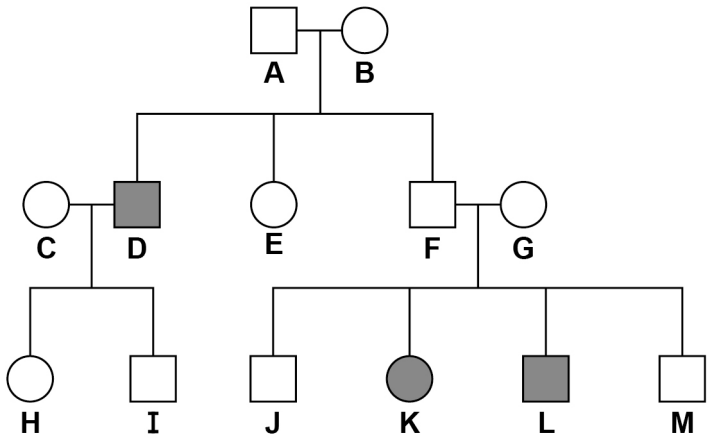
4.6.1.4 Genetic inheritance

Question 04

0 3 AKU is a genetic disorder.

Figure 3 shows the inheritance of AKU in one family.

Figure 3



Key

- Male who has AKU
- Female who has AKU
- Male who does **not** have AKU
- Female who does **not** have AKU

0 3 . 1 Describe how **Figure 3** shows that the allele for AKU is recessive.

[1 mark]

0 3 . 2 Which person is **definitely** heterozygous for AKU?

[1 mark]

Tick (✓) **one** box.

C ☐ D ☐ E ☐ G ☐

4.6.1.4 Genetic inheritance

0 3 . 3 A female who has AKU and a male who is heterozygous for AKU plan to have a child.

Determine the probability that the child will have AKU.

You should:

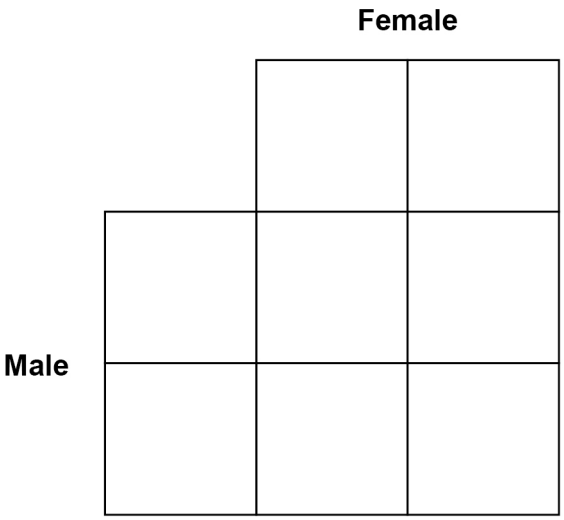
- complete **Figure 4**
- identify the phenotype of each offspring genotype
- use the symbols:

  A = dominant allele

  a = recessive allele.

[5 marks]

Figure 4



Probability that the child will have AKU = _____

Question 3 continues on the next page

4.6.1.4 Genetic inheritance

Question 04 · continued

0 3 . 4 A mutation is a change in a gene.

People who have AKU have a mutation that causes the production of a non-functioning enzyme.

Enzymes are proteins.

Suggest how a mutation can result in the production of a non-functioning enzyme.

[2 marks]

0 3 . 5 Some people have In Vitro Fertilisation (IVF) treatment to increase the chance of becoming pregnant.

Describe how the process of IVF can result in pregnancy.

[4 marks]

4.6.1.4 Genetic inheritance

Question 04 · continued

0 3 . 6 Embryos can be screened to detect inherited disorders.

Give **two** arguments **against** embryo screening.

Do **not** refer to religion in your answer.

[2 marks]

1 _____

_____

2 _____

_____

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Turn over for the next question

4.6.1.4 Genetic inheritance

Question 05

June 2025 | 8464/B/2H | Original Q1

0 1 This question is about genetics.

The fur colour of rabbits is controlled by two alleles.

0 1 . 1 Draw **one** line from each term to the meaning of the term relating to genetics in rabbits.

[3 marks]

Term	Meaning of the term
Chromosome	A fur colour that is seen
Gene	A whole strand of DNA found in the nucleus of a rabbit cell
Genome	Codes for a protein that affects fur colour
	The complete genetic composition of a rabbit

Question 1 continues on the next page

4.6.1.4 Genetic inheritance

Question 05 · continued

0 1 . 2 In rabbits:

- the allele for brown fur (**B**) is dominant
- the allele for white fur (**b**) is recessive.

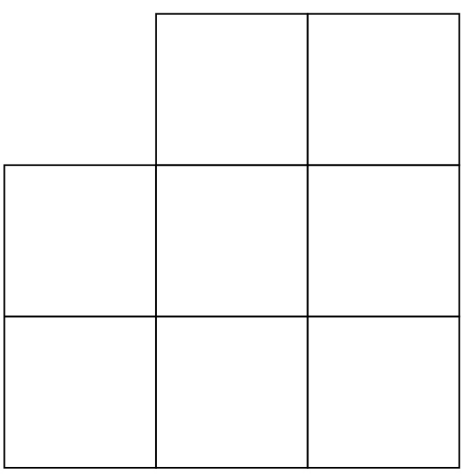
A rabbit with the alleles **Bb** and a rabbit with the alleles **bb** breed together.

Determine the probability that one of the offspring will have white fur.

You should:

- complete the Punnett square diagram
- identify any offspring that will have white fur.

[5 marks]



Probability = _____

4.6.1.4 Genetic inheritance

Question 05 · continued

0 1 . 3 A male rabbit is heterozygous for fur colour.

The rabbit's body cells have the genotype **Bb**.

One of the sperm cells from the rabbit has the allele **b**.

Explain why the alleles in the rabbit's body cells and the allele in the sperm cell are different.

[2 marks]

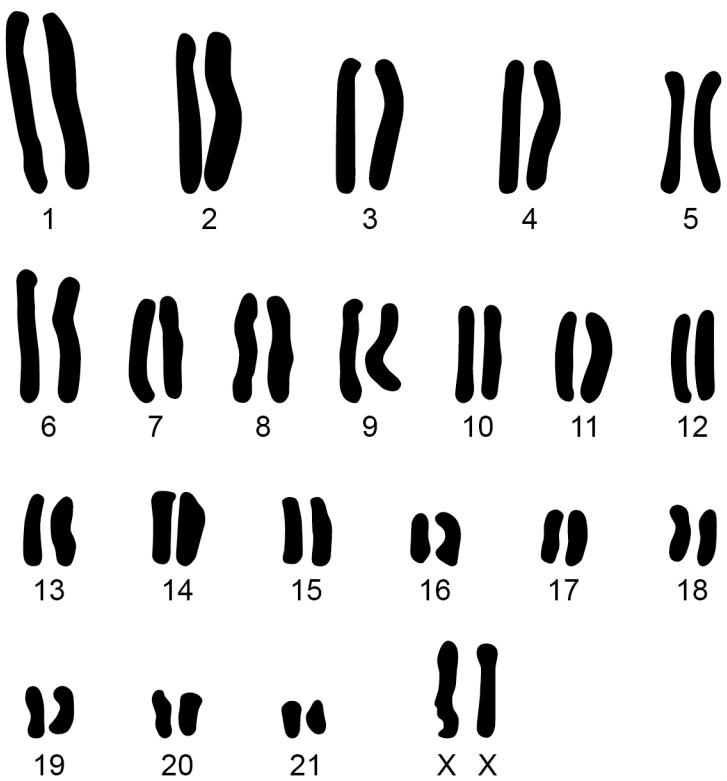
Question 1 continues on the next page

4.6.1.4 Genetic inheritance

Question 05 · continued

Figure 1 shows the chromosomes of a rabbit.

Figure 1



0 1 . 4 How many chromosomes would be found in a skin cell of a rabbit?

Use **Figure 1**.

[1 mark]

Number of chromosomes = _____

0 1 . 5 The sex of a rabbit is controlled in the same way as the sex of a human.

Give the evidence from **Figure 1** that the rabbit is female.

[1 mark]

_____

_____

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